Efficient Computation of Paracoherent Answer Sets (Extended Abstract)

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Answer Set Programming (ASP) has become one of the most frequently used formalisms (cf. [6, 9]) in Knowledge Representation. ASP offers a declarative language and allows for solving complex problems by encoding them as a logic program and computing its answer sets, which encode the problem solutions. The availability of efficient solvers has leveraged a large variety of applications [8, 11, 3, 7, 5], including industrial ones [10]. One important feature is that some logic programs have no answer sets. While this is sometimes desired for encoding problems that admit no solutions, it is sometimes perceived as detrimental, especially when dealing with query answering. Addressing this issue, paracoherent semantics based on answer sets have been proposed to draw meaningful conclusions also from incoherent programs [4]. The term paracoherent has been chosen to highlight both similarities and differences to paraconsistent semantics: their goal is similar, but the latter addresses classical logical contradictions, while the former addresses contradictions due to unstratified ("cyclic") negation. Practical applications of these paracoherent semantics hinge on the availability of efficient algorithms and implementations. The first implementations of paracoherent semantics for ASP were presented in [1], and rely on the epistemic transformation of ASP programs. This transformation underlies the theoretical foundations of the semantics [4], and constructs a few algorithms around it that build upon existing ASP solvers. The fact that this method relies on the epistemic transformation introduces considerable overhead, though.

In [2] we introduced an alternative view on the previous paracoherent answer set semantics, which has a strong impact on the computation of paracoherent answer sets. We characterized paracoherent answer sets in terms of (extended) externally supported models, introducing a new transformation of the program that is more parsimonious than the classical one in terms of the number of additional atoms and the number of new rules. This transformation can be used in place of the epistemic transformation in existing solving algorithms without requiring any other modification. We developed concrete implementations that use the new transformation associated with algorithms of [1]. An empirical performance comparison on benchmarks from ASP competitions shows that the new transformation brings huge performance improvements that are independent of the underlying algorithms. The ideas presented in [2] represent a significant step towards in the state of the art of methods for computing paracoherent answer

sets, which opens new possibilities for implementing concrete applications of paracoherent semantics.

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